

# Technology Briefs for **No Child Left Behind** Planners

The No Child Left Behind (NCLB) legislation emphasizes the importance of leveraging the power of technology in all areas of K-12 education, from reading to science to special education. As a result, education leaders at the state and local levels are expected to develop plans that effectively employ technology to enhance learning and increase student achievement. Accurate, up-to-date information about using technology to improve curriculum, assessment, and teaching is vital to inform educational leaders as they plan their NCLB programs.

In response, the Northeast and Islands Regional Technology Consortium (NEIRTEC) has created a series of Technology Briefs for NCLB planners. The topics of these Technology Briefs were selected to reflect the U.S. Department of Education requirements for state and local applications, and they provide NCLB planners with effective strategies, key questions to consider, and selected resources that will inform the application and planning process.

Technology Briefs for NCLB Planners can be obtained at no charge by visiting <http://www.neirtec.org>.

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Technology Briefs for No Child Left Behind Planners  
was developed by the  
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**Additional briefs include:**

Goals

Steps to Increase Accessibility

Promotion of Curricula and Teaching Strategies That Integrate Technology

Professional Development

Technology Type and Costs

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## **Strategies for Improving Academic Achievement and Teacher Effectiveness**

*Local technology applications and plans should include a description of how the applicant will use Ed Tech funds to improve the academic achievement, including technology literacy, of all students and to improve the capacity of all teachers to integrate technology effectively into curriculum and instruction.*

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### **Overview**

Technology will have the greatest impact on student learning when integrated into the curriculum to achieve clear, measurable educational objectives (Hawkins, Panush, & Spielvogel, 1996). In order for meaningful, sustainable school improvement to occur, school reform initiatives that involve technology need to coordinate five issues—leadership, core vision, professional development, time, and assessment (Honey, 2001). It is clear that technology tools and resources must become an integral part of both the teaching and learning process if they are to have an impact on student achievement.

Before planning for technology, therefore, it is crucial to develop a clear set of goals, expectations, and criteria for improvements in student learning. Additionally, it is important to establish and support an ongoing staff development program tied to criteria for improvements in student learning. Then, specific curricula, practices, skills, attitudes, and policies that can be enhanced through the use of technology can be identified.

### **Key Questions to Consider**

- How can technology be used to support the improved academic achievement, including technology literacy, of all students?
- What strategies will you use to improve teachers' capacity to integrate technology effectively into curriculum and instruction?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

*“If technology isn’t used properly or isn’t fully integrated into the project at hand, it will gather dust and offer nothing in the way of student academic improvement.”*

(McKeon, 2001)

## Strategies for Addressing Local Technology Applications and Plans

### *Technology Supporting Improved Academic Achievement*

A shift has taken place in recent years from teaching students how to use technology to focusing on using technology to support content. Technology can no longer be looked at in isolation but rather as part of a carefully planned program of school change as it relates to student achievement. Technology can broaden the range of students' choices as they learn. Students routinely use technology tools to find information, collect, organize and interpret data, and present results. In addition, technology offers teachers options for adapting instruction to special student needs. The following strategies suggest ways technology can be used to support improved academic achievement:

1. Use technology in support of student learning in key content areas by linking to existing district or school initiatives. For example, process writing goals can be supported with portable smart keyboards and webbing tools (e.g., Inspiration). Build technology into the math curriculum in areas such as data organization and interpretation (databases and spreadsheets) or exploration of mathematical concepts (see <http://standards.nctm.org/document/eexamples/>). Support early literacy initiatives with technologies that incorporate reading, writing, speaking, and listening (e.g., Wiggleworks).
2. Teachers can work within specific content areas to integrate technology rather than making technology a separate subject area. Consider: What do students need to learn, and how can technology promote those learning goals? When revising curriculum in a specific subject area, the committee that is charged with this task could also be specifically charged with looking into the selection of technology tools and resources to support learning in this area. It is best if curriculum and technology leaders work together to create planning documents to ensure that district learning goals are in both the curriculum and technology plans. Working together, they can create curriculum plans that include technology skills and resources where appropriate and beneficial to student learning, identify student and

teacher technology skills needed to use technologies for learning, and plan where these skills can be integrated into professional development (for teachers) and curriculum (for students).

3. District leaders can use technology tools to collect, organize, analyze, disaggregate, and report on student achievement data. Student achievement data is complex, but it offers a tremendous opportunity to identify strengths and weaknesses in curriculum and instruction when properly analyzed and synthesized. Data organization and manipulation tools such as spreadsheets, relational databases, and automated student information systems can assist in this task. Administrators can involve teachers in the process of looking at student performance data to inform curriculum and instruction decisions and practices. Teachers' use of portable technology tools (e.g., PDAs, hand-held computing devices) can assist them in classroom assessment.
4. Technology can be used to support different learning styles and meet the needs of all learners in the district. For example, technology supports a district-wide focus on differentiated learning with universal design for learning concepts: multiple means of expression (multimedia presentation tools), multiple means of engagement (simulations, online manipulatives, content-based software), and multiple means of representation (digital images, digital sound, animation, text-to-speech resources). Curriculum materials should be varied and diverse and should include digital and online resources in addition to traditional text resources. Technology can also facilitate developmentally appropriate learning experiences by providing information in a variety of ways (visual, auditory) and at a variety of levels.

#### *Increased Teacher Capacity*

Technology can and should play an important role in curriculum planning, development, delivery, assessment, and administration. Technology must be “institutionalized in schools”—integrated into the culture and classroom practice of a school (Nelson, Post, & Bickel, 2001). Professional development is essential to ensure that teachers are able to choose the most appropriate technologies and instructional strategies to meet district curriculum goals and student learning needs. The primary reason teachers do not use technology is a lack of experience with the technology itself (Wenglinsky, 1998). Teachers need to be supported in their efforts to use technology.

When properly trained and supported, teachers can effectively use technology to find content-based resources, deliver instruction, and support and enhance curriculum.

1. The Enhancing Education Through Technology Act of 2001 requires that “not less than 25 percent of funds [will be used] to provide sustained and intensive, high-quality professional development” (Section 5216a). A district can support content-based professional development with curricula and teaching strategies that integrate technology, particularly in areas identified by the district as areas of concern or focus. For example, professional development focused on “writing across the curriculum” can be supported with technology tools such as graphical organizers (Inspiration) and portable writing devices. This strategy necessitates cooperation and common planning and goal setting between curriculum directors, support personnel, technology directors, and staff. Districts might consider providing a variety of flexible and on-going professional development formats and options (online, after school, summer, staff meetings, release days).
2. It is important to allocate appropriate hardware, software, and support resources to encourage the capacity-building process. Consider providing on-site technical and instructional support for the integration of technology. A possible strategy involves using technology integration specialists to support teachers. Training, materials, and modeling should show how technology can be used to support curriculum, making the push for technology and the push for standards complementary rather than competing mandates on teachers. Consider creating professional development centers (real or virtual) in schools or districts where teachers can meet to learn, practice, and share new ideas and strategies.
3. Experience has shown the importance of creating school conditions that support and encourage teachers as they work to develop basic technology skills and integration strategies. Consider providing in-school time for professional development, collegial sharing, curriculum planning, and teacher experimentation. Teachers will need easy access to reliable, Internet-connected teacher workstations/presentation stations in their classroom. Possible strategies include making laptops available to teachers for at-home use,

ensuring that district software may be used by teachers at home for curriculum planning, and allowing teachers to access school/district servers and networks from outside of school.

4. It is important that district/school goals and expectations support teachers in their integration efforts. Aligning teacher evaluation systems and hiring practices with the system technology goals and vision will support technology integration into the curriculum.

## Extended Resources

*National Educational Technology Standards for Students*

<http://cnets.iste.org/index2.html>

An excellent resource for establishing technology competencies for students can be found in this publication.

*National Educational Technology Standards for Teachers*

<http://cnets.iste.org/index3.html>

This resource provides a set of expectations for teacher technology skills.

The Profiler

<http://profiler.hprtec.org/>

This online survey tool may be useful to assess technology strengths and weaknesses.

The Learning with Technology Profile Tool

<http://www.ncrtec.org/capacity/profile/profile.htm>

This program presents indicators of engaged learning and indicators of technology that educators can use to identify their own strengths and weaknesses.

NCREL (North Central Regional Educational Lab)

<http://www.ncrel.org/sdrs/areas/te0cont.htm>

“Critical Issue” papers that focus on technology in education.

Universal Design for Learning (UDL)

<http://www.cast.org/udl/>

The CAST website provides tools, examples, and research to support the use of technology to meet the needs of all learners.

Enhancing Education Through Technology Act of 2001. Title II, Part D of Elementary and Secondary Education Act, 2001.



## References

*Enhancing Education Through Technology Act of 2001*. Title II, Part D of Elementary and Secondary Education Act, 2001.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.

Hawkins, J., E.M. Panush, & R. Spielvogel. (1996). National study tour of district technology integration (Summary report). New York: Center for Children and Technology, Education Development Center.

Honey, M. (2001). *Issues to support local school change*. Retrieved May 28, 2002. Available online at <http://www.pt3.org/VQ/html/honey.html>.

Subcommittee on 21st Century Competitiveness. *Improving Student Achievement Through Technology*. 107th Congress, March 15, 2001. Retrieved May 28, 2002. Available online at <http://edworkforce.house.gov/hearings/107th/21st/tech31501/osmckeon.htm>.

Nelson, C., J. Post, & B. Bickel. (2001). *Institutionalization of technology in schools checklist*. Retrieved May 28, 2002. Available online at <http://www.wmich.edu/evalctr/checklists/institutionalizationoftech.pdf>.

Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics*. Princeton, NJ: ETS Policy Information Center-Research Division.





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## Goals

*Local technology applications and plans should include a description of the applicant's specific goals, aligned with State standards, for using advanced technology to improve student academic achievement.*

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## Overview

The primary goals of the Ed Tech Program are to improve student academic achievement through the use of technology, ensure that all students become technologically literate by the end of eighth grade, promote the effective integration of technology into on-going professional development, and advance research-based instruction through technology integrated curriculum development.

In order to receive Ed Tech funds, applicants must articulate specific goals for using technology to improve student achievement. It is important for goals to align with and support challenging state curriculum content standards in order to maximize funds and efficiently utilize existing resources. Goals should be concrete and measurable and specifically describe what applicants wish to accomplish. Additionally, goals must include connections to related areas such as professional development, resources coordination, academic achievement improvement strategies, and steps to increase accessibility.

### Key Questions to Consider

- How do your goals support local curriculum initiatives aligned with national and state content standards?
- How do your goals contribute to a comprehensive system that supports effective uses of technology and contributes to improved student achievement?
- How do your goals support the use of technology for ongoing professional development for teachers and administrators?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

## Strategies for Addressing Local Technology Applications and Plans

### *Establishing Goals*

#### **Goal Statements:**

Goal statements ought to be specific and clearly describe what you wish to accomplish so that specific action steps can be defined and outcomes measured. In order to maximize efforts and resources, these goals should:

- support the vision outlined in your local educational technology plan;
- be consistent with the objectives of your statewide technology plan;
- align with school and district curriculum priorities and initiatives;
- promote teaching strategies and curricula that integrate technology effectively;
- advance improved student achievement;
- align with challenging national and state content standards;
- support and advance student technology literacy;
- and improve the capacity of teachers, principals, and administrators to integrate technology effectively into curriculum and instruction.

The goals statements could relate to professional development, curriculum development and integration, technology literacy, access, or student achievement. Below are a few sample goals.

#### **Sample Goals:**

##### Professional Development

Professional development is the training and development needed by teachers, administrators, and staff to use technology tools within the teaching and learning environment. According to Planning into Practice (SEIRTEC, 2000), “professional development goals should address both the how and the why of teaching and learning with technology.”

- Our teachers will participate in online professional development to acquire instructional strategies and pedagogy necessary to facilitate learner-centered, standards-based curricula that integrate the use of technology tools.

*“It is the ability of all students—no matter whether rich or poor, or whether they are from a small town, a city, a rural area, or a suburb—to learn at the highest levels with the greatest resources and have the promise of a future of real opportunity.*

*This is the potential of technology.”*  
(Richard W. Riley, 1998)

*“Goals are dreams with deadlines.”*

(Diana Scharf-Hunt)

- Our teachers, administrators, and staff will participate in professional development opportunities necessary to advance the technical skills required to foster online communication among students, teachers, administrators, parents, and community members.
- Our administrators will participate in professional development to acquire the tools and skills needed to analyze student achievement data.
- Our teachers will be provided release time and access to an online forum in order to share individual content expertise with other staff in the school, district, and region.

### Student Technology Literacy

A stated goal of the Ed Tech Program is “to assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade.” In order to more clearly understand what is meant by technology literacy, the International Society for Technology in Education (ISTE) has established National Educational Technology Standards (NETS) for students. These standards describe what students should know and be able to do with technology and provide extensive guidance in the establishment of technology literacy goals. The following are sample goals in this area:

- Our students will develop technology literacy in the area of communications through the use of telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Our students will use technology resources for solving problems and making informed decisions in technology infused mathematics, science, social studies, and language arts classes.
- Our students will use technology enhanced research tools to locate, evaluate, and collect information from a variety of sources.

### Access

Access is the availability of resources necessary to utilize technology for teaching and learning. This includes access to hardware, software, online resources, and support. The goals in the area of access should be explicit about the resource as well as the intended result.

- A ratio of one workstation to every three students will be

established in each school in the district in order to ensure access for learners to write and publish across the curriculum.

### Curriculum Development and Integration

Curriculum development and integration goals should describe how the technology will support the state and national learning standards in core curriculum areas. They should make explicit which tools will be incorporated and how the tools will be used.

- Our middle school teachers will incorporate technology tools and online mini-applications into the standards-based mathematics curriculum in order to support student investigations and data analysis.
- Our elementary teachers will incorporate the use of technology tools such as text-to-speech and word-processing hardware and software into the classroom in order to facilitate the writing process, promote creativity, and increase accessibility to text content.

### **Extended Resources**

*Learning Through Technology: A Planning and Implementation Guide*

<http://www.ncrel.org/tandl/homepg.htm>

This resource helps educators and community members work through the stages needed to develop a comprehensive learning and technology plan. The efforts of 15 ISBE Technology Demonstration sites are highlighted.

*Plugging In: Choosing and Using Educational Technology*

<http://www.ncrted.org/capacity/plug/plug.htm>

Plugging In discusses what is known about effective learning and effective technology, and puts it together in a planning framework for educators and policymakers. After reading about effective learning and technology, educators can follow the instructions in the center insert to actually use the framework to plan technology and technology-enhanced programs that complement learning.

*Critical Issues: Technology in Education*

<http://www.ncrel.org/sdrs/areas/te0cont.htm>

This Internet site provides critical issues concerning technology in education. It is a link off the website Pathways to School Improvement that provides rich resources on numerous topics affecting school improvement.

## References

*National Educational Technology Standards for Teachers: Preparing Teachers to Use Technology* (2002). Eugene, OR: International Society for Technology in Education.

McNabb, M., G. Valdez, et al. (1999). *Technology Connections for School Improvement: Planners Handbook*. IL: NCREL, U.S. Department of Education.

Porter, B. (1999). *Grappling with Accountability*. Sedalia, CO: Education Technology Planners, Inc.

Sun, J., M. Heath, et al. (2000). *Planning into Practice: Resources for planning, implementing, and integrating instructional technology*. Austin, TX: SEIRTEC Partners.

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## Steps to Increase Accessibility

*Local technology applications and plans should include a description of the steps the applicant will take to ensure that all students and teachers have increased access to technology. The description must include how the applicant will use Ed Tech funds to help students in high-poverty and high-needs schools, or schools identified for improvement or corrective action under section 1116 of Title I, and to help ensure that teachers are prepared to integrate technology effectively into curricula and instruction.*

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### Overview

The issue of increased accessibility to technology has taken on new meaning for teachers and students, even as connectivity has improved and the number of computers in schools has steadily increased. Accessibility extends beyond hardware and connections to encompass a complex combination of factors that includes training, content, attitudes, learner differences, and supportive environments for both teachers and students.

#### Key Questions to Consider

- Are your educators trained and encouraged in a supportive environment to utilize technology with content that will effectively enhance the achievement of all students (regardless of gender, socioeconomic status, race, ethnicity, or special needs)?
- Do your teachers have access to high quality content that is appropriate, relevant, and engaging for every student (regardless of gender, socioeconomic status, race, ethnicity, or special needs)?
- Do all of your students (regardless of gender, socioeconomic status, race, ethnicity, or special needs) have positive, supportive learning opportunities that are hands-on experiences with technology resources and high-quality content?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

*“Without broad access,  
there will be little demand  
for the innovative content  
and applications that can  
bring new teaching  
techniques and new  
assessment models.”*  
(Web-Based Education  
Commission)

## Strategies for Addressing Local Technology Applications and Plans

### *Infrastructure for Technology*

Over the past five years, the CEO Forum Report has chronicled the remarkable progress districts and schools have made in acquiring hardware, establishing connectivity, ensuring teachers receive technology training and integrating digital content into the curriculum. In addition to analyzing these issues, the CEO Forum has developed several useful tools that can be applied during planning for technology. One of these tools, the STaR Chart, provides a useful rubric that a *No Child Left Behind* (NCLB) applicant may apply when analyzing their district's effectiveness of integrating technology into the teaching and learning process. For example, the Texas Education Agency Educational Technology Advisory Committee (ETAC) developed its own version of the STaR Chart for the purpose of planning, budgeting and evaluating technology readiness at the district level. The foundation of these charts is a set of indicators that describe four distinct school types: Early Tech, Developing Tech, Advanced Tech and Target Tech. The Texas STaR Chart provides the following infrastructure indicators for Target Tech schools:

- Students per computer ratio: One student per computer
- Teacher per computer ratio: One computer per teacher
- Replacement Cycle: Computer replacement established for three or less years
- Internet Access: Internet in all rooms on all campuses; adequate bandwidth to each classroom over the local area network (at least 100 MB or fiber network LAN); easy access for students and teachers; some wireless connectivity
- Distance Learning: Web-based/on-line learning; satellite-based learning over video distribution network; two-way distance learning classrooms in each of the campuses in the district
- Wide Area Network / Local Area Network (WAN / LAN): All campuses connected to the WAN sharing multiple district-wide resources; robust WAN with 100 MB/GB and/or fiber switched network that allows for resources such



as, but not limited to, video streaming and desktop teleconferencing; easy access to network resources for students and teachers, including some wireless connectivity

- Other Technologies: Fully equipped classrooms with technology to enhance student instruction readily available, including all the above as well as new and emerging technologies such as PDAs and IP telephony.

Although the STaR Charts do not provide a definitive measure for determining a specific level of access, they do provide the NCLB applicant with several clearly defined benchmarks that will help them identify the necessary planning steps needed to ensure that all students and teachers have increased access to technology.

#### *Meeting the needs of all learners*

Beyond connectivity and equipment, an effective technology plan addresses the equitable access barriers of gender, poverty, race, ethnicity, and special needs. These barriers, whether subtle or overt, may impact “the students’ ability to use it [technology] toward meaningful goals” (U.S. Department of Education, 2000) and are especially evident in schools that are low performing or that have high needs and few resources. One general strategy to address learner differences includes the application of universal design principles in order to improve usability for all students. Universal Design for Learning (UDL) is a new paradigm for teaching, learning and assessment, drawing on new brain research and new media technologies to respond to individual learner differences (CAST, 2000). UDL strategies include a range of assistive technologies that have emerged to address a variety of special needs, including learning disorders, vision and hearing impairments, and limited fine motor skills. The rapid development of new solutions has resulted in improved assistive technologies at affordable costs that make access possible for every student. Solutions include screen readers, sound amplifiers, and hardware modifications, among others. More approaches to specific barriers may include equal access and relevant content for males and females, culturally relevant resources, and adaptive technologies.

#### *Supporting Curriculum, Assessment and Instruction*

As applicants consider the issue of accessibility, an essential step includes evaluating how technology tools and applications are aligned to the curriculum, assessment, and instruction development process. This alignment will strengthen the expectation that all students will use technology in the learning process, and highlight the

importance of preparing teachers to deliver honed curriculum units that leverage technology solutions.

## Extended Resources

Benton Foundation

<http://www.benton.org/>

This resource provides an excellent resource for developing strategies to articulate a public interest vision for the digital age.

The CEO Forum

<http://www.ceoforum.org/>

Nationally recognized program that provides guides, tools and resources targeted at assisting schools to effectively prepare all students to be contributing citizens and productive workers in the 21st Century.

The Texas STaR Chart

<http://www.tea.state.tx.us/technology/etac/>

Modeled after the CEO Forum STaR Chart, the Texas STaR Chart provides districts with planning, budgeting, and evaluating tools.

The Center for Applied Special Technology

<http://www.cast.org/>

CAST is a leading organization in applying technology solutions to expand opportunities for all people, including those with disabilities.

Adaptive Technology for the Internet: Making Electronic Resources Accessible to All

<http://www.ala.org/editions/samplers/mates/index.html>

This website provides districts with information on how technology can support people with disabilities.

## References

Center for Applied Special Technology. *Summary of Universal Design for Learning Concepts*. Retrieved June 12, 2002. Available online at <http://www.cast.org/udl/index.cfm?i=7>.

U.S. Department of Education (2000). *The Secretary's Conference on Educational Technology: Measuring Impacts and Shaping the Future*. Retrieved June 12, 2002. Available online at <http://www.ed.gov/Technology/techconf/2000/report.html#question4>.

Russell, M., D. Bebell, et al. (2002). *An AlphaSmart for each student: Does teaching and learning change with full access to word processors?* Retrieved May, 2002. Available online at <http://www.bc.edu/research/intasc/studies/AlphaSmartEachStudent/description.shtml>.

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## Promotion of Curricula and Teaching Strategies That Integrate Technology

*Local technology applications and plans should include a description of how the applicant will identify and promote curricula and teaching strategies that integrate technology effectively into curricula and instruction, based on a review of relevant research and leading to improvements in student academic achievement.*

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### Overview

A review of relevant research to justify strategies for effective technology integration shows mounting evidence that educational technology can have a positive impact on student achievement (Honey, 2002; Valdez et al., 2000). Organizations such as the Center for Applied Research in Educational Technology (CARET) have Web sites that provide ready access to some of the best available research. Identifying relevant research and using it to promote strategies that effectively integrate technology into curricula and instruction is critical; by strategically planning and promoting technology integration at the curriculum development stage, schools and districts can align both technology and curriculum directly to teaching strategies and therefore stand a better chance of achieving effective technology integration from classroom to classroom across the organization.

#### Key Questions to Consider

- How will you identify curricula and teaching strategies that integrate technology effectively and lead to improvement in student academic achievement?
- How will you promote the use of these curricula and teaching strategies that integrate technology effectively in your district?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

## Strategies for Addressing Local Technology Applications and Plans

### *Identifying Curricula and Teaching Strategies*

Recognizing the limitations of this growing body of research, districts must design their own processes to make technology selection an integral part of their curriculum and professional development strategies and must develop assessment routines that will demonstrate the value of the curriculum and teaching strategies which have been enriched by technology. Fortunately, this work can be facilitated by Web sites where content has been carefully screened and categorized for K–12 schools by experts in subject matter and pedagogy.

Some specific strategies that experience has shown to be useful to district leaders:

*“With ever-increasing choices for both technology (i.e., films, video, multimedia, or Internet) and content, the need is unprecedented for thoughtful, purposeful use, carefully aligned with complementary classroom instruction and desired learning outcomes.”*  
(Marshall, 2002)

1. Many districts are now recognizing that the ideal time to plan for the integration of technology is during curriculum-specific revision cycles. When revising the curriculum in a specific subject area, for example, mathematics, the committee that is charged with this revision can also be specifically charged with looking into the selection of technologies and teaching strategies to support teaching and learning in this subject area. For this reason, districts might consider including individuals experienced with the application of technology in the particular curriculum area in the committee. (District-based experts and outside experts are both helpful.) Decisions on curriculum can then reflect the selection of printed materials, software, and online resources as well as the teaching strategies that support their use. Excellent subject-specific resources are available; some of these are listed below.
2. Many districts have created positions such as that of instructional technology specialist. This person focuses on supporting teachers in matching technology to curriculum needs and in developing teaching strategies that make the best use of the technology and are most likely to maximize student learning. These positions are sometimes called TPDs (Technology Professional Development specialists) or technology integration specialists.

3. School-based teams of teachers (e.g., math department, third grade teacher team) are excellent vehicles for identifying online resources and software applications that enrich the curricula that they are teaching. These teacher teams can offer mutual support as they become more familiar with technology and learn about the links between their curriculum and specific technologies. They can learn from and share their experiences in working with technology with their students. One approach for this kind of collaborative work utilizes “action research,” a term that is used to describe research methodologies which pursue both action and critical reflection/understanding (Dick, 1999; Reason & Bradbury, 2001).

#### *Promoting Curricula and Teaching Strategies*

Many approaches are being used by districts to promote curricula and teaching strategies that integrate technology. Districts are designing and adopting both policy-oriented and support-oriented approaches.

Policy-oriented approaches are those adopted by a school or district at the initiative of the administration or a faculty committee. These approaches set the parameters for decisions made by teachers. They include:

- adoption of specific curricula with technology components;
- inclusion of technology criteria in teacher (and principal) evaluation instruments; and
- inclusion of technology criteria in a teacher's individual professional development plan.

Support-oriented approaches are those that focus on encouragement of teachers by peers (e.g., colleagues, mentors, or individuals with roles such as the TPD) to examine, and consider changing, existing teaching practice. These approaches include co-planning, co-teaching, and modeling of units by more experienced teachers, as well as more traditional approaches such as workshops during and after school and summer institutes. Increasingly, districts are aiming to focus support-oriented approaches on specific educational objectives closely related to a teacher's responsibilities, avoiding one-size-fits-all workshops.

The experience of many districts indicates that the most effective way to promote the adoption of new curricula and teaching strate-

gies for effective technology integration includes both kinds of approaches—policy-oriented and support-oriented.

## Extended Resources

Marco Polo website

<http://marcopolo.worldcom.com/>

This site links to six content-specific sites: mathematics, humanities, science, arts, geography, and economics. Each subject-specific site presents carefully selected Internet-based activities linked to national standards. In mathematics, for example, the site has been developed and is hosted by NCTM; similar professional organizations host the other sites and are responsible for evaluating all content.

*Exemplary and Promising Educational Technology Programs 2000*

<http://www.ed.gov/pubs/edtechprograms/>

The final report of the Expert Panel on Educational Technology, appointed by the U.S. Department of Education. The panel conducted a national competition to identify exemplary and promising programs. Seven were identified through this process and are described in this report.

*National Educational Technology Standards for Students (NETS•S)*

<http://cnets.iste.org/index2.html>

The standards contain examples of effective technology use in all subject areas.

Project MEET professional development program

<http://meet.terc.edu/public/TPDS/tpdrole.cfm>

A description of a training program for Technology Professional Development specialists.

Good Models of Teaching with Technology (GMOTT)

<http://knowledgeloom.org/gmott/index.jsp>

A conceptual framework that helps teachers and curriculum leaders identify effective uses of technology; it has been developed by TERC based on Jonassen, D.H., Peck, K.L., Wilson, B.G. & Pfeiffer, W.S. (1999), *Learning with technology: A constructivist perspective* (Upper Saddle River, NJ: Prentice Hall).

Means, B., Penuel, W., & Padilla, C. (2001). *The connected school: Technology and learning in high school*. (San Francisco: Jossey-Bass).

A recent research study that presents a conceptual framework, “Student-Empowering Uses of Technology,” similar to GMOTT.

Knowledge Loom Spotlight



<http://knowledgeloom.org/gmott/>

Created by NEIRTEC, this site highlights the GMOTT conceptual framework in the context of real classrooms.

## References

Dick, B. (1999). *What is action research?* Retrieved May 28, 2002.

Available online at

<http://www.scu.edu.au/schools/gcm/ar/whatisar.html>.

Honey, M. (2002). New approaches to assessing students' technology-based work. In *Great expectations: Leveraging America's investment in educational technology*, edited by N. Dickard. Washington, DC: Benton Foundation, Communications Policy Program and Education Development Center, Inc., Center for Children and Technology. Retrieved June 12, 2002. Available online at

<http://www.benton.org/e-rate/execsummary.html>.

Marshall, J. M. (2002). *Learning with technology: Evidence that technology can, and does, support learning*. Retrieved May 28, 2002. Available online at <http://www.ciconline.org/section.cfm/2/20>.

Reason, P. and H. Bradbury. (2001). *Handbook of action research: Participative inquiry and practice*. London: SAGE Publications.

Valdez, G., M. McNabb, et al. (2000). *Computer-based technology and learning: Evolving uses and expectations*. Retrieved May 28, 2002.

Available online at <http://www.ncrel.org/tplan/cbtl/toc.htm>.

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## Professional Development

*Local technology applications and plans should include a description of how the applicant will provide ongoing, sustained professional development for teachers, principals, administrators, and school library media personnel to further the effective use of technology in the classroom or library media center.*

---

### Overview

Research into effective professional development during the past two decades has established key lessons and principles that can help inform the planning of professional development programs in all areas, including those focused on technology integration. In summaries of the lessons from research, Sparks and Hirsh (1997) describe a shift in effective staff development, away from one-day inservice presentations to professional development that is designed to be an integral, ongoing part of teachers' lives, focused on improving student learning outcomes, based on inquiry into teaching and learning, and built on interactions within professional learning communities.

#### Key Questions to Consider

- Do you have an overall professional development plan, tied to goals and standards, that provides for ongoing and sustained staff training?
- Is your professional development for technology linked to curriculum programs and student performance?
- Does each of your educators develop an individual professional development plan that includes technology integration skills?

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## Strategies for Addressing Local Technology Applications and Plans

Major research studies and syntheses by Darling-Hammond and McLaughlin (1995), Ball and Cohen (1999), the National Foundation for the Improvement of Education (1996), and others point to a consistent set of recommendations which tell us that effective professional development:

*“When teachers have access to high quality, results-driven, content-specific staff development, their students’ academic achievement increases.”*  
(National Commission on Teaching and America's Future, 1996)

- envisions the professional teacher as one who learns from teaching rather than as one who has finished learning how to teach;
- focuses on improving classroom practices and increasing student learning;
- centers around the critical activities of teaching and learning—planning lessons, evaluating student work, and developing curriculum—rather than around abstractions and generalities;
- values and cultivates a culture of collegiality, involving a sharing of knowledge and experience among educators;
- is sustained and intensive, supported by modeling, coaching, and problem solving around specific problems of practice;
- builds upon investigations of practice through cases, questions, analysis, and criticism and substantial professional discourse;
- is continuously woven into the everyday fabric of the profession of teaching;
- fosters a deepening of subject-matter knowledge, a greater understanding of learning, and a greater appreciation of students’ needs;
- provides occasions for teachers to reflect critically on their practice;
- engages teachers in looking closely at students and their work;
- makes effective use of information and communications technologies;
- provides opportunities for meaningful teacher leadership roles to emerge.

### *Professional Development for Technology Integration*

Research and analyses of successful schools have established that good professional development is essential for teachers to make effective use of technology to enhance teaching and learning (Web-based Commission, 2000; Becker & Riel, 2001, *enGauge*, 2000).

A long-term study of the Apple Classroom of Tomorrow (ACOT) project followed teachers over several years as they learned to use technology in their classrooms. The researchers identified five stages of “instructional evolution” for using technology and documented that different professional development activities are appropriate at each stage (Dwyer et. al., 1997):

- At the *entry* stage, teachers learn to master the new tools themselves and begin to plan how to use them in their classrooms.
- At the *adoption* stage, teachers begin to blend technology into their classroom practices, without making any significant changes to those practices.
- At the *adaptation* stage, the new technology becomes thoroughly integrated into traditional classroom practices and teachers begin to see some real benefits in student learning and engagement.
- At the *appropriation* stage, the teachers understand technology, use it effortlessly in their own work and in the classroom, and have difficulty imagining how they would function without it.
- At the *invention* stage, teachers experiment with new instructional patterns and ways of relating to students and to other teachers enabled by the technology, resulting in significant changes in their classroom practices and professional lives.

In addition, from a study of technology integration and a review of the research, Grant (1996) adds that:

- Professional development for technology must extend a vision of technology as an empowering tool for teachers and students.
- Professional development for technology integration is most effective when it is in the context of curriculum content, effective pedagogy, and student learning, not focused on the technology itself.

Grant specifically points out that simply sending teachers to training sessions on the use of specific technologies has not yielded the

desired results: “too often the results of these sessions have fallen short of hopes: there has been little carryover into the classroom, and new technologies have remained on the periphery of school life and been used only sporadically by teachers.” In contrast “effective programs in [technology integration] professional development are inextricably linked to building a professional culture in schools, one which supports qualities of reflection and collaboration in the context of action.”

#### *Online Professional Development*

The widespread availability of computers and Internet access opens up a new means for providing professional development: online workshops and professional exchanges. This is a new field, just beginning to be explored, so the formal research is very limited. However, analyses of the potential in light of the principles of effective professional development point to some ways in which online approaches can significantly enhance professional development programs (NSDC, 2001). For example, online professional development can:

- provide “anytime, anyplace” flexibility that results in new professional development opportunities being available;
- incorporate many of the principles of effective professional development;
- enable new collegial relationships and professional learning communities;
- provide access to resources, colleagues, and experts that may not be available otherwise;
- spread professional development activities over time and integrate them directly with classroom practice;
- give teachers a chance to experience for themselves new ways of learning, which can inform their decisions about the use of technology with their students;
- increase access to personalized learning experiences;
- potentially reduce the costs of professional development programs;
- be blended with face-to-face meetings, study groups, coaching, and other professional development activities to enhance comprehensive professional development programs.

There are many factors that must be considered in order to create an effective online professional development program, such as defining the professional development needs addressed, planning the connections with other professional development activities, developing local expertise to create and facilitate online workshops, providing incentives to participants, and making sure adequate technology access and support is available (Treacy et. al., 2002).

Experience so far has shown that delivering good online professional development is challenging, that it can be effective, and that it is best employed as one part of a multi-faceted, well-designed professional development program.

## Extended Resources

National Staff Development Council Professional Development Standards

<http://www.nsdc.org/educatorindex.htm>

These standards provide direction for designing a professional development experience that ensures that educators acquire the necessary knowledge and skills.

National Staff Development Council E-Learning for Professional Development

<http://www.nsdc.org/educatorindex.htm>

This resource includes a set of useful guidelines for evaluating effective online professional development programs.

National Educational Technology Standards

<http://cnets.iste.org/>

This resource provides a set of nationally recognized technology standards for school students, teachers and school administrators. The Web site resources include guides, sample lessons, and case studies.

The NEA Foundation for the Improvement of Education

<http://www.nfie.org>

This Web site contains publications, resources and grant information targeted at improving teaching and learning in our society.

## References

*enGauge* (2000). Retrieved June 12, 2002. Available online at <http://www.ncrel.org/engauge/>.

National Commission on Teaching and America's Future (1996). *What Matters Most: Teaching for America's Future*.

National Foundation for the Improvement of Education (1996). *Teachers Take Charge of Their Learning: Transforming Professional Development for Student Success*.

National Staff Development Council (2001). *E-Learning for Educators: Implementing the Standards for Staff Development*.

WBEC (2000). *The Power of the Internet for Learning: Moving from Promise to Practice*, Web-Based Education Commission. Retrieved June 12, 2002. Available online at <http://interact.hpcnet.org/webcommission/index.htm#adobe>.

Ball, D. and D. Cohen. (1999). Developing Practice, Developing Practitioners: Toward a Practice-based Theory of Professional Education. In *The Heart of the Matter. Teaching as the Learning Profession*, edited by L. Darling-Hammond and L. Sykes. San Francisco: Jossey-Bass.

Becker, H. J. and M.M. Riel. (2000). *Teacher Professional Engagement and Constructivist-Compatible Computer Use*, Center for Research on Information Technology and Organizations. Retrieved June 12, 2002. Available online at [http://www.crito.uci.edu/tlc/findings/report\\_7/](http://www.crito.uci.edu/tlc/findings/report_7/).

Darling-Hammond, L. and M.W. McLaughlin. (1995). Policies That Support Professional Development in an Era of Reform. *Phi Delta Kappan* 76(8): 597-604.

Grant, C. M. (1996). *Professional Development in a Technological Age: New Definitions, Old Challenges, New Resources*. Retrieved June 12, 2002. Available online at [http://ra.terc.edu/publications/terc\\_pubs/tech-infusion/prof\\_dev/prof\\_dev\\_frame.html](http://ra.terc.edu/publications/terc_pubs/tech-infusion/prof_dev/prof_dev_frame.html).

Sandholtz, J. H., C. Ringstaff, et al. (1997). *Teaching with Technology*. New York: Teachers College Press.

Sparks, D. and S. Hirsh. (1997). *A New Vision for Staff Development*. Alexandria, Va: Association for Supervision and Curriculum Development.

Treacy, B., G. Kleiman, & K. Peterson. (2002). Elements of Successful Online Professional Development Programs. *Learning & Leading with Technology* in press.





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## Technology Type and Costs

*Local technology applications and plans should include a description of the type and costs of technology to be acquired with Ed Tech funds, including provisions for the interoperability of components.*

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### Overview

The ever-changing technology landscape, with its increased requests for student assessment data from stakeholders and its need to maintain a dynamic teaching and learning environment, dictates that district leaders create a long-term strategic technology plan that is flexible toward new technologies and funding models. Selecting technologies that are cost-effective and provide measurable impact on teaching and learning is a challenge, and the process doesn't stop after the technology has been placed in the hands of students, teachers and support staff. In order to successfully meet this challenge, it is crucial that school leaders understand the total cost of placing technologies into classrooms. In an effort to maximize investment in technology, many districts are rallying around the School Interoperability Framework (SIF), an industry-standard blueprint for K–12 software that acts to ensure that instructional and administrative software applications work together effectively. Understanding and incorporating SIF concepts can help school leaders successfully identify the kinds of technology to consider in system-wide planning and thus navigate the complete implementation cycle.

#### Key Questions to Consider

- What technology options effectively support teaching and learning in a variety of classroom and learning environments?
- What are some lower-cost options to providing technological support besides a desktop computer for every student?
- What are the real cost factors involved in successful uses of technology to support teaching and learning?

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## Strategies for Addressing Local Technology Applications and Plans

Recent reports on the use of technology in K–12 education provide evidence that computers are in widespread use in schools. Over 77% of instructional rooms and 98% of schools have access to the Internet (National Center for Education Statistics, 2001).

*“Schools should not focus on technology, but their individual education challenges and then match their technology solutions to those needs.”*  
(John Bailey)

For planning purposes, technology should not be exclusively considered as being the realm of computers. While not an exhaustive list, the following types of technology should also be considered: desktop and portable computers, computer software, CD-ROMs, networking hardware and connectivity (including wireless), local area and wide area networks, server computers, printers, scanners, projectors, and other peripherals, probeware, calculators, personal digital assistants (PDAs), portable word processors (e.g., AlphaSmart), and assistive technologies (e.g., special keyboards, input devices).

While a major portion of funding for school technology is focused on hardware and software (MDR), a closer calculation of the “Total Cost of Ownership” (TCO) of technology advises administrators that, “technology will impact more than your hardware and software budget, it will affect the entire school.” (IAETE) The Total Cost of Ownership model identifies the following areas for which administrators need to prepare in their long-term planning:

- Professional Development
- Support
- Connectivity
- Software
- Replacement Costs
- Retrofitting

Many Internet resources around the Total Cost of Ownership of technology provide administrators with tools for planning and budgeting costs of technology. One such tool is the Texas STaR Chart. (Texas Education Agency, 2001) This valuable resource provides an extensive rubric for evaluating a district’s technology

readiness in four key areas: Teaching and Learning, Educator Preparation and Development, Administration and Support Services, and Infrastructure for Technology. The rubric defines Administrator and Support Services in a “Target Tech” district as follows:

### **Vision and Planning**

- The technology plan is actively supported by the board
- The plan is collaboratively developed, guiding policy and practice, and is updated at least annually
- The campus plan is focused on student success and based on needs, research, proven teaching and learning principles
- Administrators use technology for planning and decision making

### **Technical Support**

- At least one technical staff to 350 computers
- Staff are centrally-deployed and campus-based
- Technical support is on-site and response time is less than four hours

### **Instructional and Administrative Staffing**

- Full-time district level Technology Coordinator/Assistant Superintendent for Technology
- Dedicated campus-based instructional technology support staff: one per campus plus one for every 1,000 students, with additional staff as needed

### **Budget**

- Campus budget for hardware and software purchases, sufficient staffing support, costs for professional development, incentives for professional development, facilities, and other ongoing costs
- Appropriate budget to support the campus technology plan

### **Funding**

- Technology allotment, TIF, other competitive grants, E-Rate

discounts, locally supplemented through tax dollars

- Other state and federal programs directed to support technology funding, bond funds, business partnerships, donations, foundations, and other local funds designated for technology

## Extended Resources

Building the 21st Century School

<http://archive.ncsa.uiuc.edu/IDT/>

This site is dedicated to helping you and your schools save money and time by coordinating your technology and facilities infrastructure needs.

Network Primer

<http://www.edc.org/LNT/news/Issue14/feature2.htm>

This resource provides a handbook of best practices for educational technology managers who do not have technical backgrounds.

The Texas STaR Chart

<http://www.tea.state.tx.us/technology/etac/>

Modeled after the CEO Forum STaR Chart, the Texas STaR Chart provides districts with planning, budgeting, and evaluating tools.

Taking the TCO to the Classroom

<http://www.classroomtco.org/>

This resource provides resources to school leaders on total cost of ownership of technology.

Technology at Your Fingertips

<http://nces.ed.gov/pubs98/tech/index.asp>

This publication describes a process for getting the best possible technology solution for your organization.

## References

Northeast & Islands Regional Educational Laboratory at Brown University (2000). *Technology Leadership*. Retrieved June 12, 2002. Available online at <http://knowledgeloom.org/tech/index.shtml>.

National Center for Supercomputing Applications (2001). *Building the 21st century school*. Retrieved Available online at <http://archive.ncsa.uiuc.edu/IDT/>.

The Doyle Report (2002). *ED's John Bailey reviews NCLB technology opportunities*. Retrieved June 12, 2002. Available online at <http://www.thedoylereport.com/spotlight/interview>.

Institute for the Advancement of Emerging Technologies in Education (2002). *K–12 total cost of ownership calculator*. Retrieved June 12, 2002. Available online at <http://www.iaete.org/tco/>.

*Digest of Education Statistics 2001* (2002). Washington, DC: National Center for Education Statistics.

Market Data Retrieval (MDR) (2002). *Selected Highlights From Technology in Education 2001*. Retrieved June 12, 2002. Available online at <http://www.schooldata.com/publications3.html>.

Institute for the Advancement of Emerging Technologies in Education Development Center (IAETE) (2002). *K–12 Educational Technology System Total Cost of Ownership Calculator*. Retrieved June 12, 2002. Available online at <http://www.iaete.org/tco/bkgnd.cfm>.

Texas Education Agency (Fall 2001). *Texas STaR Chart: a Tool for Planning and Assessing School Technology Readiness*. Retrieved June 12, 2002. Available online at <http://www.tea.state.tx.us/technology/etac/>.

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## Coordination with Other Resources

*Local technology applications and plans should include a description of how the applicant will coordinate activities supported with funds from other sources.*

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### Overview

Technology-related initiatives in a school or district might range from something as specific as “integrating graphing calculators into high school science and math classes” to something as far-reaching as “using technology tools to support differentiated learning across all curriculum areas in all grade levels.” The funding sources for these initiatives vary. What these initiatives do have in common, however, is the necessity for some degree of innovation and change (within the district, administration, school culture, or teachers' practice) and the necessity for a coordination of focus if there is to be successful implementation of the new ideas. If these varying innovations are consistent with district initiatives, the rate of adoption of the new ideas will be faster (Rogers, 1995).

Many schools and districts are finding they can fund transformation by combining previously separate funding sources to support integrated school initiatives. Karen Hawley Miles (2000) describes three school-level resources: the use of time, the organization of staff, and the use of funds from external sources. She notes that so-called best-practice schools take some of the external resources from specific programs (such as bilingual education) and integrate those resources into school or district-wide agendas, such as literacy improvement.

### Key Questions to Consider

- How will you coordinate initiatives funded under an Ed Tech grant with other technology-related initiatives in your school or district?
- Does your plan include opportunities and structures necessary to share and coordinate resources?

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*"All together now..."*  
(Lennon &  
McCartney, 1969)

## Strategies for Addressing Local Technology Applications and Plans

In order to coordinate varied initiatives within a district, a first step might be simply to find out which existing grants could benefit from the addition of technology resources (hardware, software, support), or to find out which grants had been written to include specific technology components. These grants may be curriculum centered or might be focused on administrative issues or activities. In some districts, key staff (Director of Technology, SPED, Title One, IEP Teams, Library Media Specialists, and Curriculum Specialists) have created a map of funding sources and amounts, project activities/goals, planned professional development activities.

To ensure that technology will be used to support content and student learning goals, districts might want to staff curriculum planning committees with members that have both content knowledge and technology integration skills, or with both curriculum specialists and technology integration specialists.

To maximize resource allocation, provide technical support, and ensure district-wide implementation of the district technology plan, it is useful to develop procedures that allow for coordination of technology acquisitions and implementations through the central technology department.

## Extended Resources

The School-Wide Assistive Technology Team (SWAT)  
<http://www.mespa.org/mtc/assistive/about.html>

This project trains teams to design strategies which ensure compliance with the IDEA mandates of 1991 and 1997 requiring an Individualized Educational Plan (IEP) to consider whether a child requires assistive technology devices and services.

U.S. Department of Education, Technology Grant Programs  
<http://www.ed.gov/Technology/edgrants.html>

General information on grants and grant programs for educational technology funding.

Northwest Educational Technology Consortium  
<http://www.netc.org/grants/>

General information on grants and grant programs for educational technology funding.



Concord, NH: Case study (1999).

<http://edc.techleaders.org/idea99/resources/case.htm>

A case study done in Concord, NH, illustrates an example of pooling resources to accomplish larger district-wide goals. In this case, resources were pooled to provide technology tools to support the learning of all students.

## References

Fullan, M. (1991). *The New Meaning of Educational Change*. New York: Teachers College Press.

Lennon, J. and P. McCartney. All together now. From Yellow Submarine. Apple Records.

Miles, K. (2000). *Money Matters: Rethinking School and District Spending to Support Comprehensive School Reform*. Retrieved May 28, 2002.

Available online at

<http://www.naschools.org/uploadedfiles/MoneyMatters.pdf>.

Miles, K. (2002). *Pathways*. Retrieved May 28, 2002. Available online at <http://www.ncrel.org/sdrs/areas/issues/envrnmnt/go/haw.htm>.

Rogers, E. (1995). *Diffusion of Innovations (4th edition)*. New York: The Free Press.

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## Integration of Technology with Curricula and Instruction

*Local technology applications and plans should include a description of how the applicant will integrate technology (including software and electronically delivered learning materials) into curricula and instruction, and a timeline for this integration.*

### Overview

Districts are now realizing the power of curriculum initiatives that seamlessly integrate technology tools into daily instruction. By identifying technology solutions and instructional strategies at the curriculum-development stage, district leaders can act to maximize the impact of technology on system-wide teaching and learning and support the expansion of “pockets of technology integration excellence” that currently exist in most schools. Kevin McGillivray, educational technologist for a set of American military schools, notes that what might make sense in the short term—purchasing software in response to immediate needs—may, in the long run, cripple a district’s integration of technology with curricula and instruction.

“With multiple or disparate software programs around a school, supporting the teachers who are using software in any effective way becomes virtually impossible from a technical or educational perspective.” (p. 1)

In order to avoid the situation McGillivray describes, it is critical for school leaders to invest substantial time and resources in system-wide planning for technology integration. Done in advance, and at the curriculum-development level, such planning will enable districts to optimize their use of available funds and technology resources.

#### Key Questions to Consider

- How can you maximize the instructional impact of your existing technology resources?
- How can you balance resources for hardware, software, personnel, and professional development to reach curricular and instructional goals most effectively?

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## Strategies for Addressing Local Technology Applications and Plans

### *Maximizing Resources*

When schools across a district have different equipment and tools, and varied levels of technical expertise, it can be difficult to support technology integration efforts and ensure that technology is supporting curricula and instruction. The creation of a cohesive and well-designed plan for resource management is one way that districts can maximize their investment in technology.

*“As long as the computers are down the hall and up the stairs to the lab, they are irrelevant to education.”*  
(Soloway as quoted in Batista, 2002)

**Software.** A district that has a wide range of disparate software packages is often handicapped when attempting to implement a cohesive technology integration plan. Providing both support for a wide range of skills and guidance in the integration of a wide variety of software stretches support staff beyond their limits and results in unfocused professional development. Establishing a district-wide tool kit of standardized software for use across the district is one approach that might be considered. Identifying a set of software tools that is limited in number and is versatile and valuable across subject areas and grade levels can maximize the impact of the district’s investment. For example, districts may elect to choose a consistent “suite” of tools (i.e., Microsoft Office, Appleworks) or decide on common needs (i.e., word processing, spreadsheets, presentation software) and purchase different packages for use at different grade levels. In conjunction with a tool kit, a careful selection of additional software that supports specific curriculum initiatives will encourage efforts to integrate technology by linking technology with broader initiatives of the district. If done selectively, the value of the “tool kit” approach is preserved.

Alternatively, or in conjunction with a tool kit approach, districts may organize resources based on curriculum needs. For example, software (and hardware) could be purchased to align with specific curriculum units and support teaching approaches. With this method, resources in a first grade classroom would differ from those in a third or fifth grade classroom. Districts may wish to create a “software review” committee, comprised of both curriculum and technology specialists, to plan for the purchase, integration, and support of such resources.

**Hardware.** Districts whose goal in acquiring hardware is support for the integration of technology with curricula and instruction may want to think beyond the computer lab concept.

In this case, planning for hardware purchases should focus on optimizing access. Creating a variety of designs for hardware deployment will increase access to technology, thereby better supporting the integration of technology with curricula and instruction.

As districts consider this issue, one approach is to equip all classrooms with at least one computer with an Internet connection. This method of technology integration helps to make technology a fixture in the daily life of teachers and students and aids faculty in forming the habit of using basic electronic communication (email and Internet). As their comfort with the technology increases, teachers will be more likely to take the next step to integrate it into classroom lessons (ACOT, 1995). A next step might be to acquire presentation equipment. As schools work with limited budgets, digital projectors can be an extremely cost-effective way for teachers to integrate technology into a variety of lessons. Whether to show satellite photos of weather patterns or to conduct a class brainstorming exercise, this application of technology will reach and engage a variety of learners.

Many districts have also implemented a combination of computer labs, classroom computer pods (two to six computers), and mobile carts of wireless laptops as effective ways to access technology. It is clear that group work can be enhanced in powerful ways by providing a computer as one of the many tools for a group to use during investigations. Both wireless technologies and laptop computers have both become less expensive, making mobile carts of wireless laptops more affordable; these technologies have the potential to place technology wherever learning is taking place rather than having to bring the learning to the computer.

**Personnel.** A district's single most important resource is its personnel. Successful initiatives carefully plan how personnel will play a part in achieving goals. "The success or failure of technology is more dependent on human and contextual factors than on hardware or software" (Valdez et al., 2000, p. iv). Educational staff and technical support staff are required to help faculty achieve technology integration. Both roles are essential, and the absence of either can derail efforts. Many districts in recent years have recognized the need to separate these roles and assign different staff to each. This division of responsibility puts technicians in charge of setting up, maintaining, and fixing equipment, and puts education technology specialists in charge of working with teachers and leading professional development. In this model, the educational technology specialist often has classroom expertise and is able to work with the teachers within the context of their school day.

### *Balancing Resources: Timelines as Planning Tools*

Some districts have spent their available funds on hardware and connectivity only to find that teachers don't know what to do with the technology now taking up valuable space in their classrooms. Some districts have spent their available funds on professional development only to find that teachers return to their classrooms unable to utilize their new skills because they have no access to technology. Good planning should balance the expenditure of resources for hardware/connectivity and for professional development.

A timeline is an example of a useful planning and communication tool. It can help a planning group sequence the interrelated aspects of district initiatives such as technology acquisition, professional development, and technical and curriculum support for teachers. Administrators can then use the timeline to communicate effectively with stakeholder groups and to build essential political support for the plan.

### **Extended Resources**

Hanau Model Schools Partnership

<http://modelschools.terc.edu/modelschools/HMSPHome.cfm>

This Web site contains articles that recount in detail one district's experience in integrating technology with curricula and instruction.

LINC Boston: The Technology Plan for Boston Public Schools

<http://boston.k12.ma.us/teach/tech.asp>

Boston's five-year comprehensive plan for technology integration. A helpful model for all districts and particularly useful for large communities.

The Basics of Using Technology in the Classroom

<http://lps.lexingtonma.org/Tech/Kansas/manual>

This handbook provides a clear example of one district's plan to introduce all teachers to a limited set of technology skills. Though dated (written in 1997), this handbook is still useful.

### **References**

Changing the conversation about teaching, learning and technology. A report on ten years of ACOT research (1995). Cupertino, CA: Apple Classrooms of Tomorrow.

Batista, E. (2001). *Debating the merits of palms in class*. Retrieved May 28, 2002. Available online at

<http://www.wired.com/news/school/0,1383,45863,00.html>.

McGillivray, K. (1999). The tool kit: An innovative approach to technology integration in networked schools. *Learning & Leading with Technology* 26 n.5: 18 - onwards.

Valdez, G., M. McNabb, et al. (2000). *Computer-based technology and learning: Evolving uses and expectations*. Retrieved May 28, 2002.  
Available online at <http://www.ncrel.org/tplan/cbtl/toc.htm>.

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## Innovative Delivery Strategies

*Local technology applications and plans should include a description of how the applicant will encourage the development and use of innovative strategies for the delivery of specialized or rigorous courses and curricula through the use of technology, including distance learning technologies, particularly in areas that would not otherwise have access to such courses or curricula due to geographical distances or insufficient resources.*

### Overview

While distance learning is not new—courses have been delivered via television and video for many years—the widespread access to the Internet provides a new and powerful option: *online courses* (also called *virtual courses*) in which teachers and students exchange information, engage in discussions, and collaborate online. Online courses are coming into widespread use at the high school level. For example, at least 14 states have launched virtual high schools to provide online courses throughout their states (Clark, 2001). These online courses extend options available to students; for example, advanced placement courses can be provided online when they could not be provided otherwise due to geographical distances or insufficient resources. Online courses can enable sharing resources across schools within a district, so that a specialized topic taught by a teacher in one school can be made available to students in other schools. Online courses can also better serve students who cannot attend school due to health or other reasons, provide more connections with students who are home schooled, and provide alternative approaches to learning for students who don't do well with traditional classroom approaches.

Research has shown that when online courses are carefully developed and implemented, they lead to successful learning. While most of this research is on college-level courses, recent studies are finding similar results at the high school level: Students in online courses most often perform as well on tests as students in traditional classes, and also report equal satisfaction with the learning experience (Phillips, R. and J. Merisotis, 1999; Russell, 1999).

### Key Questions to Consider

- What are the primary purposes that online courses can serve in extending the curriculum offerings in your district?
- What will be the process for planning, implementing, and evaluating online courses for your district? How will all the relevant constituents be involved?
- Will the online courses be developed and taught by district staff, purchased from outside the district, or some of each?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

*“Today’s challenge is to ensure that information technology increases the quantity of educational opportunities while maintaining or enhancing the quality of those opportunities.”*

(National Education Association Guide to Online High School Courses, 2002)

## Strategies for Addressing Local Technology Applications and Plans

Districts may take different approaches to providing online courses. Some have state-supported virtual high schools available. Others link to regional consortia or use virtual courses provided by local universities. Many districts are beginning to offer their own online courses taught by their own teachers, who are provided with training in online course development and facilitation. Other districts are contracting with private companies or nonprofit organizations that provide online courses, often to make advanced placement courses available in schools that could not offer them otherwise. See Clark (2001) for more information and examples about each of these approaches.

No matter which approach is taken, experience has shown that providing online courses successfully requires careful planning that involves policymakers, teachers, online course managers, parents/guardians, and students. The *Guide to Online High School Courses*, developed by the National Education Association (NEA), provides a series of questions for each constituent to consider during the planning process. It also provides a series of detailed indicators of quality in online courses, divided into seven categories that need to be considered carefully in planning:

1. Curriculum: Online curricular offerings should be challenging, relevant, and aligned with appropriate national, state, and district standards for student learning.
2. Instructional Design: Online courses should be designed to take advantage of the online learning environment and support the development of 21st-century learning skills.
3. Teacher Quality: Teachers should be skilled in the subject matter, learning theory, technologies, and teaching pedagogies appropriate for the content area and the online environment.
4. Student Roles: Students should be actively engaged in the learning process and interact on a regular basis with the teacher and online classmates.
5. Assessment: Assessment should provide opportunities for students to reflect on their own learning and work quality during the course, and give students the opportunity to demonstrate mastery of the course content.



6. Management and Support Systems: Support systems should provide resources to teachers, students, and parents comparable to those provided by face-to-face courses, as well as special support necessitated by the unique circumstances of the online environment.
7. Technological Infrastructure: The technology behind the course should work reliably, simply, and economically. Technical assistance should be available whenever needed by students or teachers.

## Extended Resources

Distance Learning Resource Network. *Distance Learning for K–12 Students*. Available at: <http://www.dlrn.org/k12/index.html>  
Based at WestEd, this resource provides information on how to find online courses for K–12 students, along with other resources about distance learning.

## References

- National Education Association (2002). *Guide to Online High School Courses*. Retrieved June 12, 2002. Available online at <http://www.nea.org/technology/distanceed/highschool>.
- Clark, T. (2001). *Virtual Schools: Trends and Issues*. Retrieved June 12, 2002. Available online at [http://www.WestEd.org/online\\_pubs/virtualschools.pdf](http://www.WestEd.org/online_pubs/virtualschools.pdf).
- Phillips, R. and J. Merisotis. (1999). *What's the Difference?: A Review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education*. Retrieved June 12, 2002. Available online at <http://www.ihep.com/Pubs/PDF/Difference.pdf>.
- Russell, T. L. (1999). *The No Significant Difference Phenomenon*. Chapel Hill, NC: North Carolina State University, Raleigh, NC.

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## Parental Involvement

*Local technology applications and plans should include a description of how the applicant will use technology effectively to promote parental involvement and increase communication with parents, including a description of how parents will be informed of the technology used.*

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### Overview

Most educators are keenly aware of the positive impact of parental involvement on student achievement. Research indicates that when parents participate in their children's education, the result is an increase in student achievement and an improvement of students' attitudes towards learning (Caplan, Hall, Lubin, and Fleming, 1997). In recent years, however, changes in social structures and increased economic pressures have reduced the time and energy some families can devote to school (enGauge). In response to these changes, more educators are applying Internet-based tools and applications as a powerful new communication link to engage parents in children's school experiences.

### Key Questions to Consider

- Does your application and long-range technology plan enable parents, educators, students and community members to contribute to and benefit from the investment in technology?
- Is the community involved in district and school strategic technology planning efforts?
- Does your application describe how parents will leverage existing networks and communication systems to facilitate communication with educators regarding student progress, assessment results, and support resources?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

*“The evidence is in: when schools and families work together to support learning, everyone benefits.”*  
(National Coalition for Parent Involvement in Education)

## Strategies for Addressing Local Technology Applications and Plans

Email, classroom websites, online student performance portfolios, and grade books are increasingly being used by teachers to keep parents informed of students' academic performance. Schools and districts are turning to the Internet as a vehicle to highlight successful programs, inform parents new to the community, and adhere to state requirements to report school achievement reports. Internet-based technologies are changing the way educators, parents, and community members exchange information and provide support to families. As educators become more comfortable communicating via technology, and as communication software becomes more robust, technology will play an increased role in supporting community connectedness to schools.

Many parents have a greater fear and misunderstanding of technology than do their children. It is imperative to involve family members in the development of school technology plans through establishing partnerships and by including parents in discussions and decisions pertaining to the development of the technology plans (Valdez). Fostering the role of parents in the planning process will result in parents serving as advocates for schools throughout the community (Cotton and Reed Wikeland, 1989). Districts are using technology tools to engage a larger audience in strategic planning efforts by using online surveys, listservs, and email. Involving parents, business partners, and the community in district and school technology planning is key to the success of both the planning process and the actual plan implementation.

The *Technology Connections for School Improvement Planners' Handbook* suggests four action steps for involving parents and the community in the technology planning process (McNabb, Valdez, Nowakowski, and Hawkes 1999).

- Create a study group to engage subcommittee members and other relevant stakeholders in discussing a school-based case study scenario.
- Develop, implement and synthesize a Parent-Community Needs Assessment survey. Conduct parent interviews during the event to collect parental needs assessment information.

- Sponsor a Family Technology Event to increase parents' awareness and hands-on experience with the types of technology the school plans to purchase.
- Conduct parent involvement programs that highlight students-parents-teachers-administrators as "Partners in Learning with Technology."

Worksheets, tools, and rubrics that support the action steps above can be accessed by visiting the handbook Web site.

## Extended Resources

Family and Community Connections with Schools

<http://www.sedl.org/connections/resources/>

Developed by the Southwest Education Development Laboratory, this Web site provides resources and strategies for connecting schools, families and communities.

The George Lucas Education Foundation

<http://www.glef.org/>

A collection of Web-based resources targeted toward policymakers, business groups, principals, and teachers building strong communities within schools using technology.

Critical Issue: Developing a School or District Technology Plan

<http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te300.htm>

Developed by the North Central Regional Education Laboartory, this Web site contains interviews with leading technology directors regarding the technology planning process and sample model technology plans.

Understanding State Standards and Assessments: How can parents and community help?

<http://www.mdk12.org/mspp/index.html>

Part of a larger Web site highlighting the State of Maryland Accountability system. It provides tips and strategies for helping parents assess data from state's accountability system.

## References

*National Coalition for Parent Involvement in Education*. Retrieved March, 2002. Available online at <http://www.ncpie.org/>.

*enGauge*. Retrieved March, 2002. Available online at  
<http://www.ncrel.org/engauge/>.

Caplan, J., G. Hall, et al. Pathways to School Improvement (1997).  
*Literature Review of School-Family Partnerships*. Retrieved March, 2002.  
Available online at <http://www.ncrel.org/sdrs/pidata/pi0ltrev.htm>.

Cotton, K., & K. Reed Wikelund. (1989). *Student and Parent  
Involvement in Education*. Retrieved March, 2002. Available online at  
<http://www.nwrel.org/scpd/sirs/3/cu6.html>.

McNabb, M. L., G. Valdez, J. Nowakowski, and M. Hawkes. (1999).  
*Technology Connections For School Improvement Planners' Handbook*.  
Retrieved March, 2002. Available online at  
<http://www.ncrel.org/tplan/tplanB.htm>.



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## Collaboration with Adult Literacy Service Providers

*Local technology applications and plans should include a description of how the program will be developed, where applicable, in collaboration with adult literacy service providers.*

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### Overview

It is important not to underestimate the need for adult literacy services in your community. On most measures of literacy, U.S. adults—even those with one to three years of college—are at or near the bottom in comparison with 19 other high-income countries (Sum, 2002, p. 19).

Each community that is served by a school district also has services to promote adult literacy. The extent of need for adult literacy services, the type of services most needed, and the providers of those services and their relationship to the schools in the community vary greatly from one community to the next. The degree to which technology is being used to support adults in learning content, skills, and opportunities for work force development also varies greatly. An important consideration for applicants serving high need populations is to understand the extent of need in their communities for increasing adult and family literacy as well as for greater access to technological resources.

### Key Questions to Consider

- What are the adult literacy needs in your community and how are they currently being met?
- In what ways might collaboration between your schools, district, and organizations that promote adult literacy around technology use produce increased benefits for each of their constituents?
- What other funds and resources, such as the 21st Century Learning Communities or the Community Technology Centers, can you access to increase your impact?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

## Strategies for Addressing Local Technology Applications and Plans

### *Determining an Approach: Who, What, and How?*

This criterion provides the applicant the opportunity to connect serving needs of adult and student learners in the community with the use of technology as a resource to meet those needs. It prompts consideration of ways to get more out of what you are doing now, building upon strengths in each area—adult education, K-12 learning, and technology resources—instead of considering them in isolation. Given the costly investment involved in acquiring technology equipment and skills, issues of access to these resources, and the potential of sharing the lessons learned from effective use of technology as a tool to support learning in both K-12 and adult education, it is useful for the applicant to consider how to capitalize on these connections in their own context. Additional funding for programs that use technology to support adult education, family literacy, acquiring the GED, and language instruction, is available through the Community Technology Centers (see NCLB, Title V, subpart 11, Sec. 5511). Another program, 21st Century Community Learning Centers, also reauthorized in NCLB, might also provide a way to support programming that meets the needs of all learners using technology as a resource (see NCLB, Title IV, Part B).

*“The National Literacy Survey estimates that about 90 million adults in the United States may lack the literacy skills needed to succeed in the economy of the future. Adult education and literacy programs provide the literacy skills people need to obtain good jobs, play active roles in the education of their children, and carry out the rights and responsibilities of citizenship.”*

(Adult Education and Literacy Home page of the U.S. Department of Education)

### **Who?**

In some cases, the local education agency provides or houses adult education services, while in others, services may be provided by county agencies or nonprofit or community based organizations that have little to no relationship with the school district. Since literacy is a cross cutting issue that affects virtually all aspects of life, and in turn is affected by policies across all domains from education to health to criminal justice, support can come from a number of different agencies and organizations. It is important to learn who provides adult literacy services in your community.

Under the Workforce Investment Act of 1998, Federal employment, adult education, and vocational rehabilitation programs were required to create an integrated “one-stop” system of workforce investment activities for adults and youths. Entities that carry out activities under the Adult Education and Family Literacy Act (re-authorized in 1998 as part of the Workforce Investment Act) are mandatory partners in this one-stop delivery system.

(<http://www.ed.gov/offices/OVAE/AdultEd/legis.html>) States differ in how they administer the federally funded State Administered Basic Grants Program under the Adult Education Act, but they also oversee distribution of funds for the Even Start Family Literacy Program, both key sources of funding to local entities that provide services.

Where the applicant is in knowing the adult literacy service providers and understanding the full range of current services, the extent of unmet need, and the degree to which technology is used as a tool will determine the next steps to be taken. A key strategy is to involve the adult literacy providers in the district and school technology planning efforts.

### **What?**

Three types of services are provided under the federally supported adult education programs. Adult Basic Education, for learners with skills below the eighth-grade level, Adult Secondary Education, for adults earning a high school diploma or the General Educational Development (GED) certificate, and English as a Second Language (ESL) services. The ESL services are the fastest growing portion of adult education programs. Each of these programs can be offered in a variety of contexts including workplace literacy and family literacy, and technology may or may not be used as a delivery system and/or as a key set of skills to be learned as part of workforce development. Additionally, services that utilize technology can be a key factor in assisting with the learning needs of adults with disabilities. It is clear that the intent of including the criterion that the applicant consider collaborating with adult literacy service providers is to assist a community in devising methods of increasing access to technology resources and in leveraging those resources to serve the learning needs of both students in K-12 and adults.

### **How?**

Collaborations must embody effective elements of involving all partners in increasing their ability to meet the needs of their constituents by working together and in using technology as a tool to support learning. Adult learners benefit from a real world problem based learning approach that has the purpose of generating skills that can be transferred to everyday life. The recent report *Benchmarking Adult Literacy in America* (<http://www.ed.gov/offices/OVAE/publicat.html>) suggests ten “Tools for Action” to increase literacy in the U.S. that can be the foundation of an effective overall approach. These include promoting:

- Cultures of life-long and life-wide learning;
- Early childhood education and care programs;



- Measures to improve the quality of education;
- Measures to reduce the inequality in the outcomes of schooling;
- Access to adult education for all citizens;
- Literacy-rich environments at work;
- Workplace literacy programs;
- Literacy-rich environments at home;
- Literacy rich environments in the community; and,
- Access to information and communication technologies.

One of the best sources of rich examples of adult learning programs that have integrated technology is *Captured Wisdom on Adult Literacy* produced by the NC-RTEC and its partner National Center for Adult Literacy (NCAL) at the University of Pennsylvania. Available on the Web (<http://www.ncrttec.org/pd/cw/adultlit.htm>) and on CD-ROM, this resource profiles seven examples that help educators learn of successful practices using video and narration by the instructors in an engaging format. “The Restaurant Problem,” for example, involves students as consultants hired to save a failing restaurant. They use technology to deal with irate customers, schedule work hours, and design new menus. “Creating Family Histories,” for ESL adult learners, is an example of using technology and teaching language skills simultaneously.

Another resource is the information provided about the Community Technology Centers on the USDOE web site (<http://www.ed.gov/offices/OVAE/AdultEd/CTC/index.html>), which includes a fact sheet, as well as listing and examples of funded projects in 44 states, Puerto Rico and the Virgin Islands. These examples can give you a flavor of the rich mix of programs, approaches and combinations of technologies including computers, Web-based and television-based approaches. This site links to information about other Community Technology Center projects, such as those funded by the National Science Foundation, CTCNet (<http://www2.ctcnet.org>), and the US Dept. of Housing and Urban Development’s Neighborhood Network Centers. While each has a different mission, they all are vehicles to increase access to technology-based resources.

## Extended Resources

The National Institute for Literacy

<http://www.nifl.gov>

This Web site has information on literacy-related issues and includes Fact Sheets, publications and many links to other adult literacy information including LINCOS (the Literacy Information and Communication System), a cooperative electronic network of the National LINCOS team at NIFL, four regional partners, representative organizations from all the states and territories, and several major national organizations. LINCOS is a one-stop literacy site at <http://nifl.gov/lincos/>.

The National Center for the Study of Adult Learning and Literacy

<http://gseweb.harvard.edu/ncsall>

The goal of NCSALL and its partner organizations is to help the field of adult basic education define a comprehensive research agenda, to pursue basic and applied research, to build partnerships between researchers and practitioners, and to disseminate research and best practices to practitioners, policymakers and practitioners. The site includes research, publications, teaching and training materials.

The National Center on Adult Literacy (NCAL)

<http://Literacy.org>

This partner that developed Captured Wisdom: Stories of Integrating Technology into Adult Literacy Instruction with the NC-RTTEC has a number of other resources and projects that inform the use of technology for adult literacy.

Bringing Technology, Teachers, and Adult Learners Together

<http://www.tech21.org/about/index.html>

This Web site is a hands-on and virtual research-to-practice dissemination system that is developing state of the art technology environments for adult learning and teaching.

## References

North Central Regional Education Laboratory, North Central Regional Technology in Education Consortium, and the National Center on Adult Literacy (2000). *Captured Wisdom: Integrating Technology Into Adult Literacy Instruction*. Retrieved June 12, 2002. Available online at <http://www.ncrttec.org/pd/cw/adultlit.htm>.

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## Accountability Measures

*Local technology applications and plans should include a description of the process and accountability measures that the applicant will use to evaluate the extent to which activities funded under the program are effective in integrating technology into curricula and instruction, increasing the ability of teachers to teach, and enabling students to reach State academic standards.*

### Overview

As educators plan the work to enhance integration of technology within curriculum, instruction, and assessment, they must concurrently plan to evaluate these efforts. Effective evaluation is critical because it:

- 1) serves as a continuous accountability guide for the educators in the district;
- 2) provides feedback and results in data that support the project in continuous improvement;
- 3) provides pre-established, required data from the district to the state; and
- 4) documents the extent to which the goals and objectives of the project are actually achieved, in terms of the work accomplished, the quality of the work, and the impact of the work.

### Key Questions to Consider

- What set of evaluation questions will most effectively yield answers to whether and how your district needs were addressed through funding provided by the grant?
- What evaluation strategies (e.g., interviews, questionnaires, classroom observations, analysis of student products or scores) will most effectively provide the data needed to address your evaluation questions?
- When addressing accountability measures, what is the quality, reach, and impact of your project's work?

*For more information, contact Keith Nuthall, Project Director, at [knuthall@edc.org](mailto:knuthall@edc.org)*

*“Understanding the impact of technology integration requires understanding technology use in a social context.”*  
(Honey, McMillan, Carrigg, 1999)

## Strategies for Addressing Local Technology Applications and Plans

### *Evaluation Questions*

The project’s evaluation questions, though carefully developed to focus on the specific work of each grant, can likely be nested under the following three overarching questions:

- How has the funding from the grant actually been used? For example, what steps has the grant applicant taken to increase accessibility of technology? What professional development strategies have been used within the project? Who within the district has participated in the professional development opportunities? What has the grant applicant done to integrate technology into curricula and instruction?
- What is the quality and reach of the work of the project, e.g., professional development activities or processes?
- What is the impact of the work, e.g., on parent-school communication, on student and teacher attitudes toward technology use, on student and teacher use of technology inside and outside the classroom, on student achievement in identified content areas?

As applicants consider these questions and how they might be customized to address their specific project work, it may also be particularly helpful to refer to appropriate state or national standards that apply, such as standards for student or teacher use of technology, e.g., National Educational Technology Standards for Teachers (NETS•T) and Students (NETS•S) established by ISTE or standards for professional development such as those established by the National Staff Development Council. Applicants might also find useful the seven dimensions for progress in education technology identified by the Milken Exchange on Education Technology as a way to organize the evaluation of progress within their district.

### *Evaluation Planning*

The evaluation plan that the applicant develops needs to demonstrate a clear understanding of: the needs on which the proposed work is based; the related data to be tracked over time; the use of evaluation strategies that will, indeed, provide the information needed to address the specific evaluation questions; and the manageability of the evaluation work by the designated internal

or external person(s) who will do the work. At a minimum, the process for planning the project evaluation involves the following:

- Identify the evaluation questions:
  - o related to what the district wishes to accomplish through the grant;
  - o that the state department of education requires to be answered;
  - o that are of particular interest to other identified evaluation audiences;
- Select the evaluation strategies (e.g., interviews, questionnaires, classroom observations, analysis of student products or scores) that will most effectively provide the data needed to address the evaluation questions;
- Identify or develop instruments to be used for data collection (e.g., classroom observation protocols, questionnaires, student product assessment rubrics);
- Develop a timeline for all evaluation activities including instrument development, data collection and analysis, and reporting/communication of results;
- Determine who will be responsible for the various aspects of the evaluation work and at what budget amount. The applicant will need to negotiate the work with either an external evaluator or internal staff members.

## Extended Resources

An Educator's Guide to Evaluating the Use of Technology in Schools and Classrooms

<http://www.ed.gov/pubs/EdTechGuide/>

This is a comprehensive, user-friendly overview of the basics of evaluation.

Assessing the Impact of Technology

<http://www.ncrtec.org/pe/index.html>

Several resources on this site are relevant to evaluating impact of technology in schools.

#### Technology Integration Progress Gauge

<http://www.seirtec.org/eval/gauge.doc>

This instrument supports school leaders in reflecting on technology integration practices in their school and improvements that can be made.

#### Evaluation Standards and Criteria for Technology Implementation

<http://www.ncrel.org/tandl/homepg.htm>

This article provides a useful overview of requirements for effective technology integration.

#### TechPlan Home Page

<http://www.wested.org/tie/techplan/>

This site provides useful tools for schools to use in self-assessment of technology integration.

### References

Honey, M., K. M. Culp et al. *Perspectives on Technology and Education Research: Lessons from the Past and Present*. Retrieved June 12, 2002.

Available online at

<http://www.ed.gov/technology/TechConf/1999/whitepapers/paper1.html>.



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## Supporting Resources

*Local technology applications and plans should include a description of the supporting resources, such as services, software, other electronically delivered learning materials, and print resources, that will be acquired to ensure successful and effective uses of technology.*

### Overview

Once hardware, professional development, and connectivity are in place, it's the careful consideration of cost, acquisition, and use of supporting resources that can boost a technology plan from adequate to highly effective. Working together, technology and curriculum coordinators are in the best position to investigate what sorts of supporting resources are available, and more importantly, to articulate a plan for how those resources will enrich curriculum and impact student achievement.

#### Key Questions to Consider

- What supporting resources and services do you already have available that effectively leverage and expand your technology investment? Where are the gaps?
- What untapped community resources are available that can provide hands-on support of technology-enhanced learning? For example, are there local institutions of higher education that can help investigate alignment of proven practices for technology integration and the methods used at your school or district?
- Does your school or district provide an expectation and structures that encourage technology and curriculum coordinators to plan together so that software, services, and resource acquisition link directly to current curriculum priorities? Are there particular supporting resources that can assist in this sort of ongoing collaboration?

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*“Technology integration is a complex challenge that is not easily addressed with a single intervention.”*  
(The Knowledge Loom, Technology Leadership Spotlight)

## Strategies for Addressing Local Technology Applications and Plans

### *Technology Means More Than Access to Computers*

While access to hardware, peripherals (digital cameras, scanners, etc.), and Internet connectivity are important basics, other key resources are necessary to ensure the effective use of such technology investments in schools. These supporting resources include publications, informational services, and known research that involve applications of technology in content area curriculum, and the professional development needed for educators to use them effectively. This thinking is drawn, in part, from a recent presentation by Richard Elmore, where he noted that “increase in school quality and performance over time requires a relentless focus on the instructional core in the context of a standards-based system” (Elmore, 2002). Technology is no exception.

It’s helpful to begin by listing the technology resources and services already available at your site and then reflecting on how these resources serve the school’s stated curriculum objectives and standards-based learning in general. Some of the connections will be obvious, such as when you review content-specific software titles, science probeware, and the like. But when you consider your software and peripherals that are general “tools” rather than content-specific applications, other questions arise: Are the digital cameras we own used to help students understand science concepts? How can software like Inspiration™ be used to support literacy development? Does our Internet connectivity and access provide ample opportunities for students to interact with real-time data and current information not available via textbooks? Do our teachers and students have the opportunity to pursue learning beyond what is offered in our own building or nearby institutions? Do we need to purchase more tools, applications, and services or rethink the ones we have?

### *Enhancing the Investment*

There are a variety of resources and services that schools can and should consider when describing and justifying the support resources needed for exemplary technology integration. Consider the following:

- subscription services that provide access to current periodicals and journals for student research (e.g. ProQuest <http://www.proquest.com>);



- subscription resources that provide access to education research to support professional learning (e.g. EduPortal <http://www.ers.org/eduP/>);
- access to free and fee-based seminars that allow educators to access colleagues and content beyond their geographic regions (e.g. ALA ICONnect Online Courses <http://www.ala.org/ICONN/onlineco.html>);
- memberships and partnerships in virtual K–12 schooling opportunities (<http://www.dlrn.org/virtual.html>);
- subscriptions to publications about technology and learning;
- district/school curriculum support staff who can model effective technology integration; and
- partnerships with community organizations that are studying and demonstrating evidence-based, technology-supported teaching and learning.

## Extended Resources

Technology Counts 2002

<http://www.edweek.com/tc02/>

Fifth edition of *Education Week's* annual 50-state educational technology report, focused on how state and district e-learning initiatives are changing the education landscape.

The Knowledge Loom: Good Models of Teaching with Technology Spotlight

<http://knowledgeloom.org/gmott>

Presents principles drawn from recent research and stories about the principles in action to help practitioners make informed decisions about effective technology integration.

The Eisenhower National Clearing House

<http://www.enc.org/>

A Web site that provides guides, tools and exemplary lessons for math and science educators.

Virtual High Schools: State of the States

[http://www.cait.org/shared\\_resource\\_docs/vhs\\_files/vhs\\_study.pdf](http://www.cait.org/shared_resource_docs/vhs_files/vhs_study.pdf)

A study of the planning and operation of virtual high schools.

### Designing for Technology Integration (DTI)

<http://neirtec.terc.edu>

This resource provides a model example of a two-day, face-to-face institute followed by six weeks of online learning for school-based leaders in various roles.

### EdTech Leaders Online (ETLO)

<http://www.edtechleaders.org/>

This program provides an example of how districts can develop the capacity to offer effective online professional development from within their organizations.

## References

Northeast & Islands Regional Educational Laboratory at Brown University. *The Knowledge Loom: Technology Leadership Spotlight*. Retrieved June 3, 2002. Available online at <http://knowledgeloom.org/tech/>.

Elmore, R. F. (2002). *Practice for Improvement*. Presentation given at the 14th Annual Northeast Superintendents' Leadership Institute, Newport, Rhode Island.



**Additional briefs include:**

Strategies for Improving  
Academic Achievement  
and Teacher Effectiveness

Goals

Steps to Increase  
Accessibility

Promotion of Curricula  
and Teaching Strategies  
That Integrate Technology

Professional Development

Technology  
Type and Costs

Coordination with  
Other Resources

Integration of Technology  
with Curricula and Instruction

Innovative  
Delivery Strategies

Parental Involvement

Collaboration with Adult  
Literacy Service Providers

Accountability Measures

Supporting Resources

## Key Questions to Consider

*A collection of key questions to consider for each area.*

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### Strategies for Improving Academic Achievement and Teacher Effectiveness

- How can technology be used to support the improved academic achievement, including technology literacy, of all students?
- What strategies will you use to improve teachers' capacity to integrate technology effectively into curriculum and instruction?

### Goals

- How do your goals support local curriculum initiatives aligned with national and state content standards?
- How do your goals contribute to a comprehensive system that supports effective uses of technology and contributes to improved student achievement?
- How do your goals support the use of technology for ongoing professional development for teachers and administrators?

### Steps to Increase Accessibility

- Are your educators trained and encouraged in a supportive environment to utilize technology with content that will effectively enhance the achievement of all students (regardless of gender, socioeconomic status, race, ethnicity, or special needs)?
- Do your teachers have access to high quality content that is appropriate, relevant, and engaging for every student (regardless of gender, socioeconomic status, race, ethnicity, or special needs)?
- Do all of your students (regardless of gender, socioeconomic status, race, ethnicity, or special needs) have positive, supportive learning opportunities that are hands-on experiences with technology resources and high-quality content?

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*"It is the ability of all students—no matter whether rich or poor, or whether they are from a small town, a city, a rural area, or a suburb—to learn at the highest levels with the greatest resources and have the promise of a future of real opportunity.*

*This is the potential of technology."*  
(Richard W. Riley, 1998)

*"Goals are dreams with deadlines."*  
(Diana Scharf-Hunt)

### **Promotion of Curricula and Teaching Strategies That Integrate Technology**

- How will you identify curricula and teaching strategies that integrate technology effectively and lead to improvement in student academic achievement?
- How will you promote the use of these curricula and teaching strategies that integrate technology effectively in your district?

### **Professional Development**

- Do you have an overall professional development plan, tied to goals and standards, that provides for ongoing and sustained staff training?
- Is your professional development for technology linked to curriculum programs and student performance?
- Does each of your educators develop an individual professional development plan that includes technology integration skills?

### **Technology Type and Costs**

- What technology options effectively support teaching and learning in a variety of classroom and learning environments?
- What are some lower-cost options to providing technological support besides a desktop computer for every student?
- What are the real cost factors involved in successful uses of technology to support teaching and learning?

### **Coordination with Other Resources**

- How will you coordinate initiatives funded under an Ed Tech grant with other technology-related initiatives in your school or district?
- Does your plan include opportunities and structures necessary to share and coordinate resources?

### **Integration of Technology with Curricula and Instruction**

- How can you maximize the instructional impact of your existing technology resources?
- How can you balance resources for hardware, software, personnel, and professional development to reach curricular and instructional goals most effectively?

### **Innovative Delivery Strategies**

- What are the primary purposes that online courses can serve in extending the curriculum offerings in your district?
- What will be the process for planning, implementing, and evaluating online courses for your district? How will all the relevant constituents be involved?
- Will the online courses be developed and taught by district staff, purchased from outside the district, or some of each?

### **Parental Involvement**

- Does your application and long-range technology plan enable parents, educators, students and community members to contribute to and benefit from the investment in technology?
- Is the community involved in district and school strategic technology planning efforts?
- Does your application describe how parents will leverage existing networks and communication systems to facilitate communication with educators regarding student progress, assessment results, and support resources?

### **Collaboration with Adult Literacy Service Providers**

- What are the adult literacy needs in your community and how are they currently being met?
- In what ways might collaboration between your schools, district, and organizations that promote adult literacy around technology use produce increased benefits for each of their constituents?
- What other funds and resources, such as the 21st Century Learning Communities or the Community Technology Centers, can you access to increase your impact?

### **Accountability Measures**

- What set of evaluation questions will most effectively yield answers to whether and how your district needs were addressed through funding provided by the grant?
- What evaluation strategies (e.g., interviews, questionnaires, classroom observations, analysis of student products or scores) will most effectively provide the data needed to address your evaluation questions?
- When addressing accountability measures, what is the quality, reach, and impact of your project's work?

### **Supporting Resources**

- What supporting resources and services do you already have available that effectively leverage and expand your technology investment? Where are the gaps?
- What untapped community resources are available that can provide hands-on support of technology-enhanced learning? For example, are there local institutions of higher education that can help investigate alignment of proven practices for technology integration and the methods used at your school or district?
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